Forest Herbicide Residues in Surface Water and Plants in the Tribal Territory of the Lower Klamath River Watershed of California

December 9, 2002
Klamath

P. Wofford, K.S. Goh, D. Jones, H. Casjens
Department of Pesticide Regulation

H. Feng, J. Hsu, D. Tran, J. Medina, J. White,
Center for Analytical Chemistry
California Department Food & Agriculture

Outline

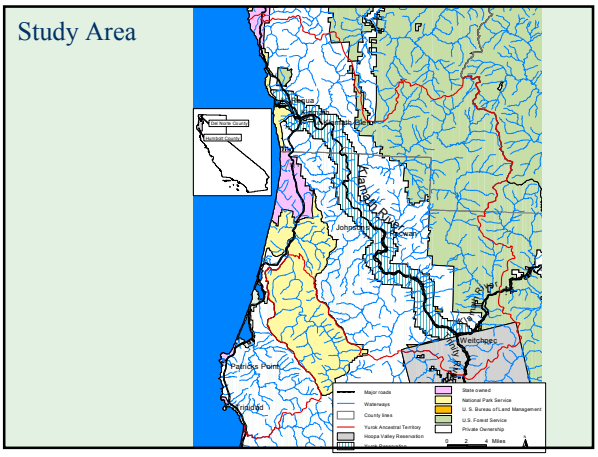
- Introduction
- Objectives
- Sampling Methods
  - Water sampling
  - Plant sampling
  - Fish tissue sampling
- Results and Discussion

Introduction

- U.S. EPA grant
- Herbicide exposure concerns
- Yurok Environmental Monitoring Work Group

Yurok Environmental Monitoring Work Group

- Tribal members and staff
- County Department of Agriculture personnel
- Timber company personnel
- CIBA personnel
- Department of Pesticide Regulation personnel



Herbicides Monitored

- Atrazine
- 2,4-D
- Glyphosate
- Triclopyr

Objectives

WATER

- Monitor aerial herbicide application drift into waterways
- Monitor herbicide runoff during rainfall events

PLANTS

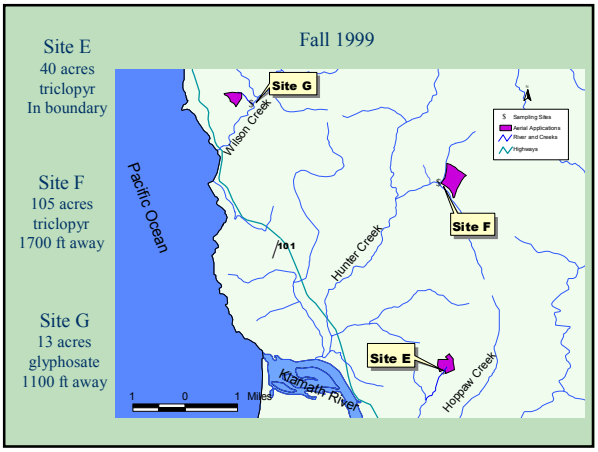
- Monitor aerial herbicide application drift
- Measure rate of herbicide dissipation on plants at application sites

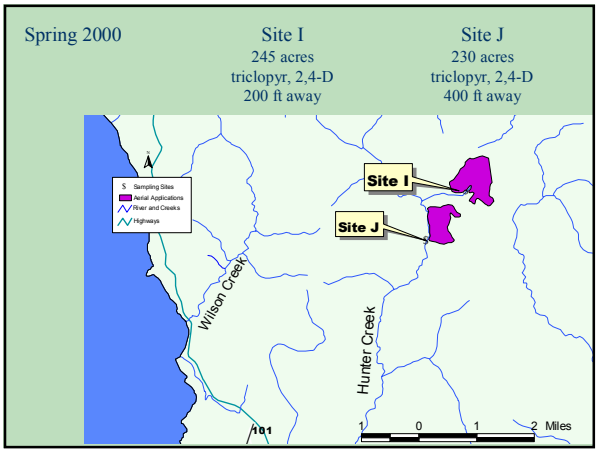
Water Sampling Methods

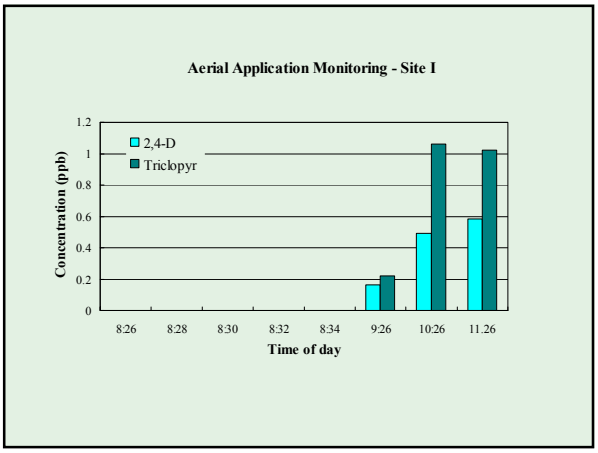
- Grab sample
- ISCO® autosampler
- Minimum Detection Limits:
  - Atrazine = 0.05 ppb
  - 2,4-D and triclopyr = 0.10 ppb
  - Glyphosate = 2.00 ppb
- Water Quality Parameters:
  - Temperature, pH, dissolved oxygen, and electrical conductivity

Drift During Application

- Monitored waterways which ran through application area
- Five aerial applications monitored
- Sampled during entire application







Rainfall Event Monitoring

- 12 sites monitored
- Both ground and aerial applications monitored

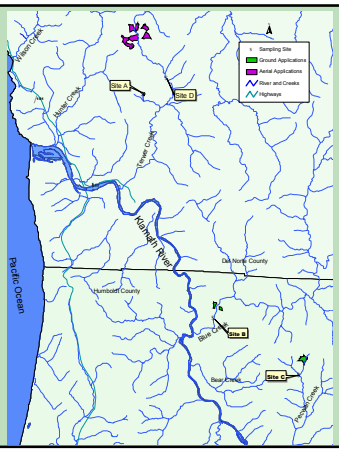
Spring 1999

Site A
ground
9 acres
atrazine
82 ft away

Site B
ground
36 acres
atrazine, triclopyr
2500 ft away

Site C
ground
25 acres
atrazine
2500 ft away

Site D
aerial
360 acres
2,4-D, atrazine
2 miles away

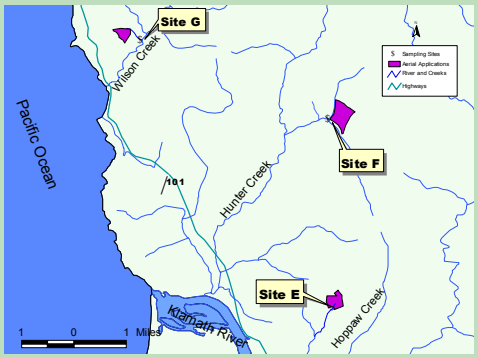


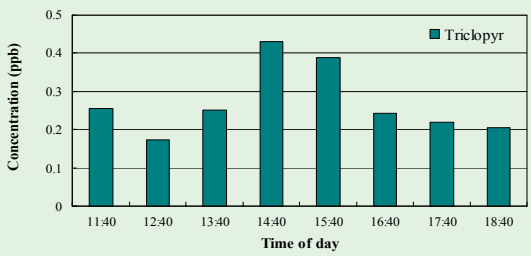
Fall 1999

Site E
40 acres
triclopyr
In boundary

Site F
105 acres
triclopyr
1700 ft away

Site G
13 acres
glyphosate
1100 ft away





Spring 2000

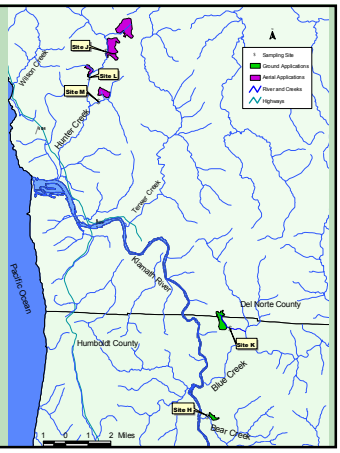
Site H
ground
36 acres
atrazine, triclopyr
500 ft away

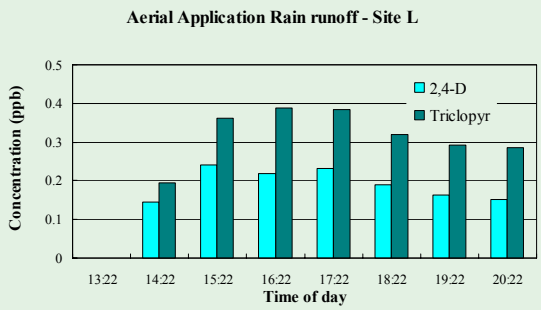
Site J
aerial
230 acres
2,4-D, triclopyr
400 ft away

Site K
ground
80 acres
atrazine
1300 ft away

Site L
aerial
20 acres
2,4-D, triclopyr
200 ft away

Site M
aerial
100 acres
2,3-D, triclopyr
1600 ft away





Plant Sampling Methods

- Only triclopyr and 2,4-D were monitored
- Composite samples

Plants Selected For Monitoring

- Beargrass (*Xerophyllum tenax*) - leaves
- Huckleberry (*Vaccinium ovatum*) - berries
- Maidenhair fern (*Adiantum pedatum*) - stems
- Manzanita (*Arctostaphyllos* spp.) - berries
- Oregon grape (*Berberis nevosa*) - roots
- Tanoak (*Lithocarpus densiflorus*) - acorn
- Willow (*Salix* spp.) - shoots
- Yarrow (*Achillea milleforlium*) - stems and leaves

Minimum Detection Limits for 2,4-D and triclopyr on monitored plants

- Beargrass = 0.05 ppm
- Huckleberry = 0.05 ppm
- Maidenhair fern = 0.05 ppm
- Manzanita = 0.03 ppm
- Oregon grape = 0.05 ppm (estimated)
- Tanoak = 0.05 ppm
- Yarrow = 0.10 ppm

Off-site Movement During Application

- Four applications monitored
- Sampling sites on downwind side of application
- Sampled beargrass, yarrow, and huckleberry

Site P
225 acres
beargrass

Site Q
35 acres
Beargrass
huckleberry

Site S
25 acres
yarrow

Site V
25 acres
beargrass

Site	Distance (ft)	Number of Samples	Average Concentration (ppm)	
			triclopyr	2,4-D
P	121	1	ND	ND
	210	1	ND	ND
Q	185 - 215	6	ND	ND
	220 - 240	6	ND	ND
	250 - 285	6	ND	ND
S	20 - 23	3	0.11	0.10
	100 - 150	4	ND	ND
V	0	3	0.56	0.41
	30 - 41	3	0.14	0.10
	50 - 90	3	ND	ND

Dissipation sampling

- Five application areas monitored
- Sampled beargrass, huckleberry, manzanita, and yarrow

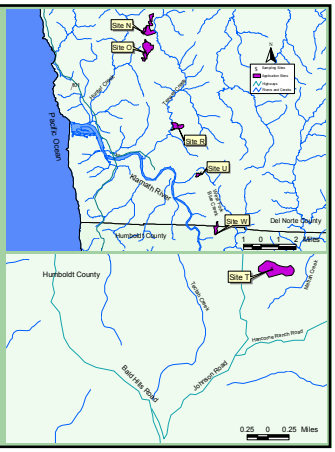
Site N
25 acres
beargrass

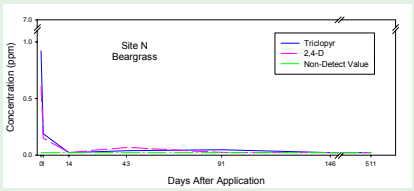
Site O
66 acres
beargrass

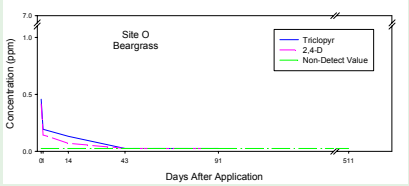
Site R
116 acres
huckleberry
yarrow

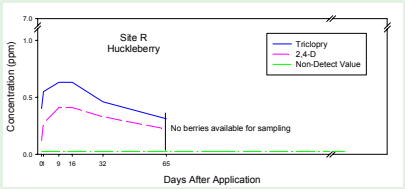
Site T
45 acres
Manzanita

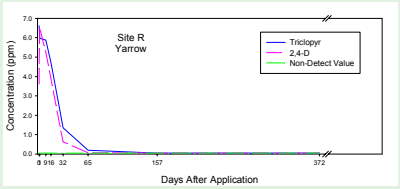
Site W
40 acres
beargrass

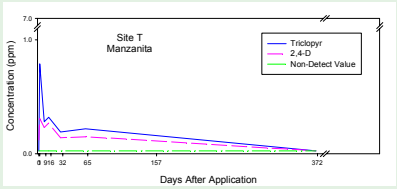


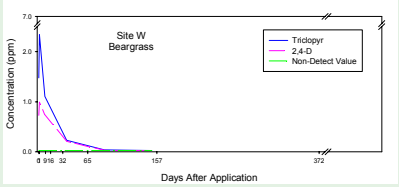






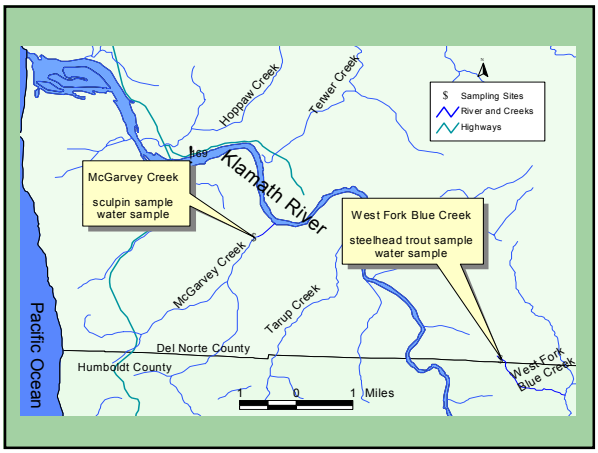






Fish Tissue Sampling with the Department of Fish and Game

- Chemical analysis by the Department of Fish and Game
- Sampled fish tissue and water in two creeks downstream from applications
- Sampled:
  - sculpin (*Cottus gulosus*) in McGarvey Creek
  - steelhead trout (*Oncorhynchus mykiss*) in the West Fork of Blue Creek


Hoopaw Creek
Terwer Creek
$ Sampling Sites
River and Creeks
Highways
Klamath River
McGarvey Creek
sculpin sample
water sample
West Fork Blue Creek
steelhead trout sample
water sample
McGarvey Creek
Tarup Creek
Pacific Ocean
Del Norte County
Humboldt County
West Fork Blue Creek
1 0 1 Miles